Factsheet 07

Te Whakaheke o Te Wai

Dataworth

Groundwater management requires decision making regarding water use, sustainability of abstraction, streamflow, and contamination risks. Data required to support these decisions is typically expensive to collect over long timeframes (> 10 years), so it is important to invest in the most useful data. We can establish the value of new and existing observations (e.g., stream flow, groundwater level) in the context of the decision being made. The "worth" of data refers to the ability of an observation to reduce the prior uncertainty (of predictions) made by groundwater models, or the extent to which the history matched posterior uncertainty would be increased if that data was removed. We do this through linear analysis: sensitivity, uncertainty, and decision making.

Major recharge zone
■ Uncertainty increase ■ Uncertainty decrease
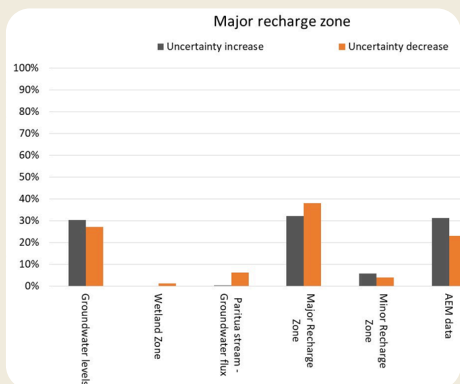
Differing results from the removal and adding data approaches indicates some redundancy in the dataset (see figure). This graph is an example of little redundancy in the dataset for this prediction.
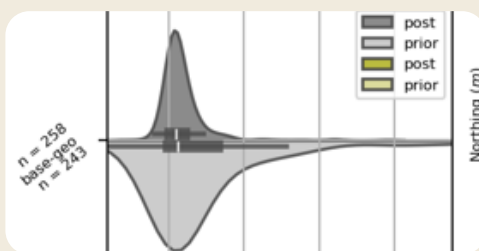
Dataworth

- **Model sensitivity**: calculating sensitivity of modelled decision outcomes (e.g., groundwater levels, flow rates) to changes in model data types (e.g., recharge, soil properties, pumping).
- **Uncertainty reduction**: requires an understanding of the uncertainty of data and parameters (e.g., hydraulic conductivity) and the sensitivity of the decision reliability to those parameters.
- **Decision making**: this combination allows us to identify which data most influences decision reliability. In this way we can establish the worth of new and existing data in terms of the extent to which they make decisions most reliable.

The worth of data in the Heretaunga Plains and Wairau Plains has been used to assess the value of different data types for selected resource management decisions. Data types explored included:

- groundwater level
- streamflow
- SkyTEM
- environmental tracer (e.g., tritium) to reduce uncertainty of groundwater age estimates.

Reduced uncertainty distribution. New data (top/post) compared to an initial distribution without new data (bottom/prior).

"Data collection informed by dataworth analysis is similar to shining a light in a dark room, it does not eliminate all of the unknowns, but it allows us to move forward more confidently. It shows us where our uncertainties can be reduced, and where they can not." - John Doherty.

Rawlinson, Z.J.; Hemmings, B.J.C.; Moore, C.R. 2024 Hawke's Bay 3D aquifer mapping project : Heretaunga Plains numerical groundwater model updates using SkyTEM data. GNS Science consultancy report 2024/10LR. 14 p.